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TITLE: Input Circuit of Television Tuner In  
Which Interference Caused By FM  
Broadcasting Signal Is Attenuated

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INPUT CIRCUIT OF TELEVISION TUNER IN WHICH INTERFERENCE  
CAUSED BY FM BROADCASTING SIGNAL IS ATTENUATED

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

The present invention relates to an input circuit of a television tuner.

2. Description of the Related Art

An input circuit of a conventional television tuner 10 will be described with reference to Fig. 2. A first terminal 51 to which a television signal is input is shunted by a CB trap 52 for attenuating a CB band and is connected to an input tuning circuit 57 sequentially through an intermediate frequency (IF) trap circuit 53 15 for attenuating an intermediate frequency band, a frequency modulation (FM) trap circuit 54 for attenuating an FM broadcasting band, and first and second diodes 55 and 56 which are connected in series each other. The cathodes of the first and second diodes 55 and 56 are 20 connected to each other. The first diode 55 is provided at the side of the first input terminal 51. The second diode is provided at the side of the input tuning circuit 57. The input tuning circuit 57 is switched by a diode 57a so as to be tuned to a low band and a high band of 25 VHF bands.

On the other hand, a second terminal 61 to which an FM broadcasting signal is input is connected to the input tuning circuit 57 through an inductance element 62 and

third and fourth diodes 63 and 64 serially connected to each other. The cathodes of the third and fourth diodes 63 and 64 are connected to each other. The third diode 63 is provided on the second input terminal 61. The fourth 5 diode 64 is provided at the side of the input tuning circuit 57. The anode of the fourth diode 64 is connected to the anode of the second diode 56.

A bias voltage from a voltage dividing circuit 60 for dividing a power supply voltage B is independently 10 applied to each of the anodes and cathodes of the first through fourth diodes 55, 56, 63, and 64.

The anode of a fifth diode 58 is connected to the anode of the first diode 55. The cathode of the fifth diode is connected to the collector of a first transistor 15 70. The emitter of the first transistor 70 is grounded. The bias voltage from the voltage dividing circuit 60 is applied to the collector of the first transistor. The cathodes of the third and fourth diodes are also connected to the collector of the first transistor 70. 20 Furthermore, the anode of a varactor diode 65 is connected to the anode of the third diode 63. The cathode of the varactor diode is connected to the collector of a second transistor 71. The emitter of the second transistor 71 is grounded. The bias voltage from the 25 voltage dividing circuit 60 is applied to the collector of the second transistor. A base is connected to the collector of the first transistor 70. The collectors of the first and second transistors 70 and 71 are high-

frequency grounded by direct current cut capacitors 72 and 73, respectively.

In the above-mentioned structure, when the first transistor 70 is switched on, the second transistor 71 is 5 switched off. Therefore, the first and second diodes 55 and 56 and the varactor diode 65 are switched off and the third and fourth diodes 63 and 64 and the fifth diode 58 are switched on. Therefore, only the FM broadcasting signal input to the second input terminal 61 is input to 10 the input tuning circuit 57. In this case, the inductance element 62 and the varactor diode 65 may form a low pass filter.

On the other hand, when the first transistor is switched off, the second transistor 71 is switched on. 15 Thereby, the first and second diodes 55 and 56 and the varactor diode 65 are switched on and the third and fourth diodes 63 and 64 and the fifth diode 58 are switched off. Therefore, only the television signal input to the first input terminal 51 is input to the input 20 tuning circuit 57.

In the above-mentioned conventional structure, in order to switch the television signal or the FM broadcasting signal and to input the switched television signal or FM broadcasting signal to the input tuning 25 circuit, a plurality of active elements (five diodes, one varactor diode, and two transistors) is used, thus increasing the cost. Also, in the case of receiving a television broadcasting which is accompanied by a video

signal rather than the case of receiving FM broadcasting which is accompanied by only voice, NF (noise factor) is electrically required. Nevertheless, since the television signal is input to the input tuning circuit through the  
5 two diodes, the NF deteriorates due to loss in the television signal caused by the diodes.

Also, when receiving the television broadcasting, since it is not possible to completely block the FM broadcasting signal between the first input terminal and  
10 the input tuning circuit by the inter-terminal capacitance of the diode in which it is necessary to block the FM broadcasting signal, the FM broadcasting signal overlaps and interferes with the television signal.

15 SUMMARY OF THE INVENTION

It is an object of the present invention to switch a television signal or an FM broadcasting signal by a small number of active elements, to input the switched television signal or FM broadcasting signal to an input  
20 tuning circuit, to reduce loss in the television signal when the television signal is received, and to reduce interference due to the FM broadcasting signal when the television signal is received.

To achieve the above object, the present invention  
25 provides an input circuit of a television tuner, comprising a first input terminal to which a television signal is input; a second input terminal to which an FM broadcasting signal is input; an input tuning circuit

tuned to the television signal and the FM broadcasting signal, wherein the first input terminal is connected to the input end of the input tuning circuit; first and second diodes serially connected between the second input 5 terminal and the input end of the input tuning circuit and simultaneously switched on or off, wherein the first diode is input to the input end of the input tuning circuit, and wherein the second diode is provided at the side of the second input terminal; an inductance element 10 interposed between the second input terminal and the second diode; and a first capacitance element that forms a low pass filter together with the inductance element in a state when the second diode is switched on and is connected between the connection point of the first diode 15 and the second diode and a ground.

The input circuit of the television tuner according to the present invention further comprises a third diode that is switched on or off simultaneously with first and second switches and is interposed between the inductance 20 element and the second diode; and a second capacitance element that forms a low pass filter together with the inductance element and the first capacitance element in a state when the second and third diodes are switched on and is connected between the connection point of the 25 second diode and the third diode and the ground.

The input circuit of the television tuner according to the present invention further comprises an FM trap circuit provided between the first input terminal and the

input end of the input tuning circuit for attenuating an FM broadcasting band; and a fourth diode connected between the connection point of the first diode and the second diode and the input end of the FM trap circuit,  
5 wherein the fourth diode is switched on or off simultaneously with the first through third diodes.

The input circuit of the television tuner according to the present invention further comprises a transistor whose emitter is grounded and whose collector is pulled  
10 up to a power supply voltage by a feed resistor, wherein the cathodes of the first, second, and fourth diodes are connected to each other, wherein the anodes of the second and third diodes are connected to each other, wherein a bias voltage lower than the power supply voltage is  
15 supplied to the anodes of the first through fourth diodes, wherein the cathodes of the first, second, and fourth diodes are connected to the collector of the transistor through a common first resistor, wherein the cathode of the third diode is connected to the collector of the  
20 transistor through a second resistor, and wherein the transistor is switched on or off.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a circuit diagram illustrating the  
25 structure of an input circuit of a television tuner according to the present invention; and

Fig. 2 is a circuit diagram illustrating the structure of an input circuit of a conventional

television tuner.

[Reference Numerals]

- 1: FIRST INPUT TERMINAL
- 2: CB TRAP CIRCUIT
- 5 3: IF TRAP CIRCUIT
- 4: FM TRAP CIRCUIT
- 5: COUPLING CAPACITANCE ELEMENT
- 6: INPUT TUNING CIRCUIT
- 6a: INPUT END
- 10 6b: DIODE
- 6c, 6d: INDUCTANCE ELEMENT
- 7: RESISTOR
- 11: SECOND INPUT TERMINAL
- 12: INDUCTANCE ELEMENT
- 15 13: THIRD DIODE
- 14: SECOND DIODE
- 15: FIRST DIODE
- 16: FOURTH DIODE
- 17: FIRST CAPACITANCE ELEMENT
- 20 18: SECOND CAPACITANCE ELEMENT
- 21: VOLTAGE DIVIDING CIRCUIT
- 22: FEED RESISTOR
- 23: TRANSISTOR
- 24, 25, 26: RESISTOR

25

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 illustrates an input circuit of a television tuner according to the present invention. In Fig. 1, a

first terminal 1 to which a television signal is input is shunted by a CB trap 2 for attenuating a CB band and is connected to an input end 6a of an input tuning circuit 6 sequentially through an IF trap circuit 3 for attenuating 5 an intermediate frequency band, an FM trap circuit 4 for attenuating an FM broadcasting band, and a coupling capacitance element 5. The IF trap circuit 3 and the FM trap circuit 4 are constituted of a parallel resonance circuit, respectively. A resistor 7 is connected to the 10 coupling capacitor element 5 in parallel. The input tuning circuit 6 is switched by a diode 6b so as to be tuned to a low band or a high band of VHF bands.

On the other hand, a second terminal 11 to which an FM broadcasting signal is input is connected to the input 15 end 6a of the input tuning circuit 6 sequentially through an inductance element 12, a third diode 13 and a second diode 14 serially connected to each other, a first diode 15, and a coupling capacitance element 5. The cathode of the first diode 15 is connected to the cathode of the 20 second diode 14. The anode of the second diode 14 is connected to the anode of the third diode 13. The first diode 15 is provided at the side of the input tuning circuit 6. The third diode 13 is provided at the side of the second input terminal 11. The anode of the fourth 25 diode 16 is connected to the connection point of the IF trap circuit 3 and the FM trap circuit 4. The cathode of the fourth diode is connected to the connection point between the first diode 15 and the second diode 14.

The connection point of the cathodes of the first diode 15, the second diode 14, and the fourth diode 16 is grounded by a first capacitance element 17. The connection point of the anode of the second diode 14 and 5 the anode of the third diode 13 is grounded by a second capacitance element 18. The first and second capacitance elements 17 and 18 constitute a low pass filter together with the inductance element 12 when the second diode 14 and the third diode are switched on. The capacitance 10 values of the first and second capacitance elements are preferably equal to each other.

A voltage dividing circuit 21 for dividing a power supply voltage B by a resistor to thus generate a bias voltage and a transistor 23 whose emitter is grounded and 15 whose collector is pulled up to the power supply voltage B by the feed resistor 22 are provided. The bias voltage from the voltage dividing circuit 21 is applied to the anodes of the first and fourth diodes 15 and 16 through the inductance elements 6c and 6d in the input tuning 20 circuit 6 and is also applied to the anodes of the second and third diodes 14 and 13 through a resistor 24.

The connection point of the cathodes of the first diode 15, the second diode 14, and the fourth diode 16 is connected to the collector of the transistor 23 through a 25 resistor 25. The cathode of the third diode 13 is also connected to the collector of the transistor 23 through a resistor 26.

It is possible to remove the third diode 13. However,

in this case, the second capacitance element 18 and the resistor 26 are removed by directly connecting the inductance element 12 to the anode of the second diode 14. The inductance element 12 and the first capacitance 5 element 17 constitute a low pass filter.

In the above-mentioned structure, when the transistor 23 is switched on, the first through fourth diodes 15, 14, 13, and 16 are switched on. Therefore, the FM broadcasting signal input to the second input terminal 11 10 is input to the input tuning circuit 6 serially through the third diode 13, the second diode 14, the first diode 15, and the coupling capacitance element 5. In this case, since the inductance element 12 and the first and second capacitance elements 17 and 18 constitute a low pass 15 filter, a signal having a frequency higher than that of the FM broadcasting signal is cut off.

In a system where the television signal and the FM broadcasting signal are input to a first input terminal 1, since both ends of the FM trap circuit 4 are short-circuited by the first diode 15 and the fourth diode 16, 20 it is possible to receive the FM broadcasting signal.

On the other hand, when the transistor 23 is switched off, the first through fourth diodes 15, 14, 13, and 16 are switched off. Therefore, only the television signal 25 input to the first input terminal 1 is input to the input tuning circuit 6. In this case, since there are no serially interposed diodes in the line (the signal line between the first input terminal 1 and the input tuning

circuit 6) through which the television signal passes, loss caused by diodes is not generated. Therefore, it is possible to improve a basic electric performance such as NF.

5       The capacitance value between the terminals of the second and third diodes 14 and 13 is extremely smaller than the capacitance values of the first capacitance element 17 and the second capacitance element 18. Therefore, since the voltage of the FM broadcasting 10 signal input to the second input terminal 11 is divided by the capacitance between the respective terminals and the first and second capacitance elements, the level of the FM broadcasting signal is lowered. Therefore, the level of the FM broadcasting signal that leaks to the 15 line (the signal line between the first input terminal 1 and the input tuning circuit 6) through which the television signal passes is lowered, thus reducing greatly interference due to overlapping the television signal with the FM broadcasting signal.

20      As apparent from Fig. 1, since the television signal and the FM broadcasting signal are switched by the four diodes and one transistor that controls the diodes, it is possible to reduce the number of peripheral parts as well as the number of active parts to be used and to thus 25 simplify the structure of a circuit.

As mentioned above, according to the present invention, the first input terminal is connected to the input end of the input tuning circuit, first and second

diodes are serially connected between the second input terminal and the input end of the input tuning circuit and are simultaneously switched on or off, the first diode is input to the input end of the input tuning 5 circuit, the second diode is provided at the side of the second input terminal, an inductance element is interposed between the second input terminal and the second diode, and a first capacitance element that forms a low pass filter together with the inductance element in 10 a state when the second diode is switched on, is connected between the connection point of the first diode and the second diode and a ground. Therefore, loss caused by the diodes is not generated when the television signal is received, thus improving the basic electric 15 performance such as NF (noise factor). Also, the voltage of the FM broadcasting signal is divided by the inter-terminal capacitance of the first diode and the first capacitance element, thus lowering the level of FM broadcasting signal. Therefore, since the level of the FM 20 broadcasting signal that leaks to the line through which the television signal passes is lowered, it is possible to further reduce interference due to overlapping the television signal with the FM broadcasting signal.

In addition, a third diode that is switched on or off 25 simultaneously with first and second switches is interposed between the inductance element and the second diode, and a second capacitance element that forms a low pass filter together with the inductance element and the

first capacitance element in a state when the second and third diodes are switched on, is connected between the connection point of the second diode and the third diode and the ground. Therefore, the voltage of the FM

5 broadcasting signal is further divided, thus lowering the level of the FM broadcasting signal. As a result, it is possible to further reduce interference due to the FM broadcasting signal.

In addition, an FM trap circuit for attenuating an FM

10 broadcasting band is provided between the first input terminal and the input end of the input tuning circuit, a fourth diode is connected between the connection point of the first diode and the second diode and the input end of the FM trap circuit, the fourth diode is switched on or

15 off simultaneously with the first through third diodes.

Therefore, even if the FM broadcasting signal is input from the first input terminal, it is possible to receive the FM broadcasting signal.

Further, a transistor whose emitter is grounded and

20 whose collector is pulled up to a power supply voltage by a feed resistor is provided, the cathodes of the first, second, and fourth diodes are connected to each other, the anodes of the second and third diodes are connected to each other, a bias voltage lower than the power supply

25 voltage is supplied to the anodes of the first through fourth diodes, the cathodes of the first, second, and fourth diodes are connected to the collector of the transistor through a common first resistor, the cathode

of the third diode is connected to the collector of the transistor through a second resistor, and the transistor is switched on or off. Therefore, it is possible to simply control the switching on or off of the first 5 through fourth diodes. Also, since it is possible to switch between the television signal and the FM broadcasting signal by changing the active element, it is possible to simplify the structure of a circuit.